NOTES

On the Occurrence of Bauxite on Truk

IN A PAPER appearing elsewhere in this issue (*Pacific Sci.* 2(3): 216) mention is made of the identification of bauxite on Moen Island in the Truk group. Although the Japanese had probably discovered this material on these islands in the course of their comprehensive search for mineral deposits throughout the former mandated area, the writer knows of no published reports on the subject. The purpose of this note is to record this occurrence and to give a brief description of the deposit.

The Truk group lies in lat. 7° 25′ N., long. 151° 30′ E., and consists of about 15 large and small volcanic islands rising out of a lagoon about 30 miles in diameter and surrounded by a reef ring. The total area of the islands within the lagoon is about 37 square miles.

The only bauxite found to date in the Truk group is located on Moen, the second largest island in the group (area about 7.3 square miles). The deposit appears to be confined to a small area of about 200 acres on the summit of Mt. Witipon (Takeun on some maps), an 890-foot peak which dominates the eastern end of Moen (see p. 218, Fig. 4, this issue). The material, represented in the collections (see p. 220, this issue) by specimen TK-23, consists of reddish-tan, irregularly shaped, vesicular nodules, which are from 2 to 3 inches in diameter, and which superficially resemble small, dried sponges. Freshly broken surfaces are mottled in shades of red and yellow, and have a fine, granular texture. These nodules occur in a pale, yellowish-buff, fine-grained clay, but are most abundant at the surface as a result of concentration during the erosion of the clay. The clay itself is the weathered residue of a fine-grained trachytic flow (see p. 219, this issue) and is quite different from the gray and deep-red clays derived from the weathering of the basalts which cover most of the island.

Early in 1947 a sample of one of these nodules was tested on a portable thermal analysis unit (Hendricks, Goldich, and Nelson, *Econ. Geol.* 41: 64–75, 1946) and was estimated to contain about 60 per cent gibbsite and 20 per cent kaolinite. From this it was estimated that the sample contained about 42.5 per cent alumina. This was determined from the gibbsite fraction alone, and no allowance was made for the alumina in the supposed kaolinite.

Recently a chemical analysis of the same nodule was made in the laboratory of the U. S. Geological Survey (W. W. Brannock, analyst), and the results were as follows:

Insol.	9.37
Al_2O_3	53.08
Fe_2O_3	7.26
TiO_2	0.66
Loss on ignition	29.68

An X-ray determination of the same material made in the laboratory of the Geological Survey, by George Switzer, showed that the predominant mineral present was gibbsite, mixed with some halloysite. Boehmite is not present, and kaolinite occurs in very small amounts. A re-examination of the curve produced by the portable thermal analysis machine shows that it carries a low peak at 140° and a strong peak at 610°. These peaks agree closely with those in the curve for halloysite given by Hendricks, Goldich, and Nelson (*op. cit.*, Fig. 5) and indicate that the second mineral should have been interpreted as halloysite. Twenty per cent of halloysite would add about 7.9 per cent of Al_2O_3 and 9.3 per cent of SiO_2 to the sample, and, considering the very rough nature of the estimate, the new totals agree very well with the analysis.

Using the standard assumption that each unit of per cent of SiO_2 makes 1.1 per cent of alumina unavailable in the Bayer process, the available Al_2O_3 of the sample is reduced to 42.78 per cent and is therefore not of commercial grade. The low iron content of this bauxite is noteworthy, especially when compared with analyses of bauxites from other islands in the Pacific, notably Bintan in the Dutch East Indies and Palau in the western

Carolines, which average at least 16 per cent Fe_2O_3.

The associated clays were also tested on the portable thermal analysis unit and were found to contain less than 5 per cent gibbsite. Two samples of clay derived from the weathering of basalt were also tested by this method. One contained a very small amount of gibbsite, the other none.

The discovery of bauxite on Truk was not unexpected, for bauxite deposits of some sort are known to occur on most of the high volcanic islands in the western Pacific. Deposits have long been known to occur on Ponape and Kusaie, the two islands which geologically are most nearly comparable to Truk. To date, the trachytic material from which this bauxite has been derived has not been found by the writer on any of the other bauxite-bearing islands, and in this respect the deposit is unique. In fact, this parent material has not been identified on any of the other islands in the Truk group itself. This does not mean that it does not occur, but merely that the reconnaissance made in 1946 was very brief, and that not all of the islands in the group were visited or studied in any detail. Yossii (*Imp. Acad. Japan, Proc.* 13: 74–77, 1937) reports trachyte from Ponape, but not from any other island in the former South Seas Mandate. Bauxite deposits, some of them rather low in iron, occur on Ponape, but their relation to the parent rock was not observed by the writer.

Although the presence of bauxite on Truk is interesting from a scientific standpoint, the deposit is too small and the bauxite is of too low a grade to be of commercial importance at the present time. No further examination of the islands for bauxite alone appears to be warranted; however, a study of the occurrence and extent of the deposits should be a part of any general geological survey of the group.—*Josiah Bridge, Geologist, U. S. Geological Survey.* (Published by permission of the Director, U. S. Geological Survey.)

Holes in the Webs of Shearwaters

DURING THE COURSE of examining young and a few adult Wedge-tailed Shearwaters (*Puffinus pacificus cuneatus*) on Rabbit and Moku Manu Islands just off Oahu, in the fall of 1947, 23 of 38 birds checked at random were found to have holes in the webs of their feet. These holes varied in number and size from several large ones (see photograph) to one or more very small ones. As many as seven holes were found in a single foot. Sometimes, as is also shown in the photograph, the holes were marginal and formed gaps on the edges of the webs.

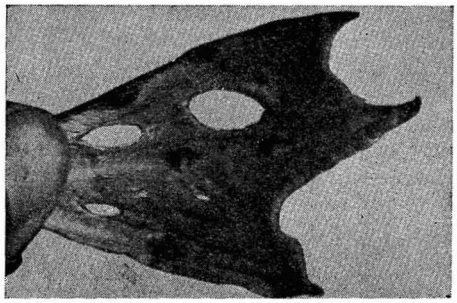

FIG. 1. Wedge-tailed Shearwater's foot. Life size.

The holes were first found in young a few weeks old (smaller young were not observed). They rarely appeared in the feet of 25 marked young which were observed from the age of about 1 month to 3 months. Once formed in these older young, the holes remained essentially unchanged. Apparently the webs became tougher and thicker with age and less easily torn. Large holes, in particular, seemed to have been acquired during the first few weeks after the young hatched.

The explanation of the holes has not been conclusively determined. Small scabs have been noted on the feet of a number of young birds. I have picked off such scabs, as a bird might, and thus made or disclosed small web perforations. (Of 6 pin pricks made in the webs of 2 young, 1 small permanent hole resulted.) Further pecking or scratching at such a small hole might well lead to a larger one, for a tear in the web soon rounds out as the edges contract and heal.

The cause of the original small scabs, if they may be taken as the starting point in hole development, seems most likely to be the bites of the large hippoboscid flies (? *Olfersia* sp.) that very commonly infest the young. Small carnivorous ants are present and might cause irritation that would be pecked. Fighting between